

NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA



THESIS

**CORPS SAM:
DOWN SELECTION TO ONE CONTRACTOR
VS. COMPETITION**

by

Thomas R. Marino Jr.

December, 1995

Principal Advisor:
Associate Advisor:

Keith F. Snider
Mark W. Stone

Approved for public release; distribution is unlimited.

19960403 050

DIGITAL QUALITY INSPECTED 1

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY <i>(Leave blank)</i>	2. REPORT DATE December 1995	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE CORPS SAM: DOWN SELECTION TO ONE CONTRACTOR VS. COMPETITION		5. FUNDING NUMBERS	
6. AUTHOR(S) Thomas R. Marino Jr.			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey CA 93943-5000		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT <i>(maximum 200 words)</i> The purpose of this thesis is to research the history of the Corps SAM program, focusing on the issue of whether to maintain competition or to down select to a single contractor. An analysis is conducted to examine the down selection and whether the program risks of cost overrun, failure to meet schedule, and poor weapon performance can be averted without the use of continuous competition. This thesis concludes that down selection to one contractor provides more benefit to the program than maintaining competition throughout the acquisition process for the Corps SAM program.			
14. SUBJECT TERMS Corps SAM, MEADS, Down Selection		15. NUMBER OF PAGES 81	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18 298-102

Approved for public release; distribution is unlimited.

**CORPS SAM:
DOWN SELECTION TO ONE CONTRACTOR
VS. COMPETITION**

Thomas R. Marino, Jr.
Captain, United States Army
M.S., University of Pittsburgh, 1985

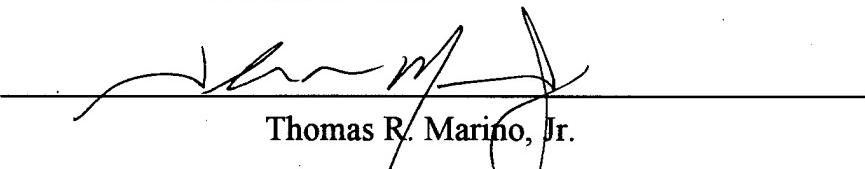
Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

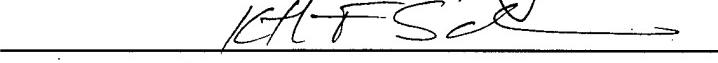
from the

**NAVAL POSTGRADUATE SCHOOL
December 1995**

Author:


Thomas R. Marino, Jr.

Approved by:


Keith F. Snider, Principal Advisor


Mark W. Stone, Associate Advisor


Reuben T. Harris, Chairman

Department of Systems Management

ABSTRACT

The purpose of this thesis is to research the history of the Corps SAM program, focusing on the issue of whether to maintain competition or to down select to a single contractor. An analysis is conducted to examine the down selection and whether the program risks of cost overrun, failure to meet schedule, and poor weapon performance can be averted without the use of continuous competition. This thesis concludes that down selection to one contractor provides more benefit to the program than maintaining competition throughout the acquisition process for the Corps SAM program.

TABLE OF CONTENTS

I.	INTRODUCTION	1
A.	GENERAL	1
B.	OBJECTIVES OF RESEARCH	3
C.	RESEARCH QUESTIONS	4
D.	METHODOLOGY	4
E.	SCOPE OF STUDY	5
F.	ASSUMPTIONS	6
G.	BENEFITS OF THIS STUDY	6
II.	CORPS SAM SYSTEM	7
A.	INTRODUCTION	7
B.	MISSION OF CORPS SAM	7
C.	BACKGROUND OF CORPS SAM	8
D.	QUADRILATERAL INTERNATIONAL AGREEMENT	13
E.	ACQUISITION STREAMLINING	15
1.	The 1995 Program Schedule	16
2.	Strategy	20
III.	AN OVERVIEW OF COMPETITION	23
A.	INTRODUCTION	23
B.	LAWS AND REGULATIONS	24
C.	DESIGN VS. PRODUCTION COMPETITION	26
1.	Design or Technical Competition	26
2.	Production Competition	27

D.	ADVANTAGES AND DISADVANTAGES OF COMPETITION . .	29
E.	COMPETITION IN THE CORPS SAM PROGRAM	30
F.	PROGRAM RISK IN TERMS OF COST, SCHEDULE, AND PERFORMANCE	32
G.	SUMMARY	33
 IV.	FACTORS AFFECTING COMPETITION VS. DOWN SELECTION . .	35
A.	INTRODUCTION	35
B.	ANALYSIS OF FACTORS AFFECTING THE DOWN SELECTION DECISION	35
1.	Cost Factors	36
a.	Quantity to be Procured	36
b.	Defense Budget and Down-sizing of the Industrial Base	37
c.	Contract Type	38
d.	Special Tooling, Test Equipment and Facilities	39
e.	Contractor Capacity	40
2.	Schedule Factors	41
a.	User Need Time Frame	41
b.	Production Duration	42
c.	Learning Curve	43
d.	Degree of Subcontracting	44
3.	Performance Factors	45
a.	Technical Complexity	45

b. Configuration Control and Maintenance Requirements	47
4. The International Factor to be Considered	48
C. SUMMARY	49
V. THE ECONOMIC VIEW OF COMPETITION	51
A. INTRODUCTION	51
B. CLASSIFICATIONS OF COMPETITION	51
C. MONOPSONY	54
D. BILATERAL MONOPOLY	55
E. PARTNERING	58
F. SUMMARY	60
VI. SUMMARY AND AREAS FOR FURTHER RESEARCH	61
A. SUMMARY	61
B. AREAS FOR FURTHER RESEARCH	63
LIST OF REFERENCES	65
INITIAL DISTRIBUTION LIST	69

I. INTRODUCTION

A. GENERAL

In previous years, the traditional role of U. S. military forces was to support peacetime deterrence through a forward presence, particularly in the European theater. Forces were deploying in a prepared defensive posture. Today, the military faces new challenges as it adapts to a world that has undergone greater change than any time since the end of World War II. These changes caused a shift in our National Military Strategy that led to a change in the U.S. military's focus from "containment of the Soviet Union and its communist ideology" to "adaptive regional planning" that provides the "strategic agility to mass overwhelming force and terminate conflict swiftly and decisively." [Ref. 22:p. 12,26] This shift in our National Military Strategy led to post-Cold War reductions in U.S. forces and redirected our strategic planning toward regional contingency operations. [Ref. 11:p. 1-4]

The U.S. Army's Air Defense Artillery (ADA) force structure, doctrine, and operational requirements are evolving in reaction to the new operational environment. A combination of the integrated capabilities of multiple systems is necessary for the defense of theater assets and maneuver forces. The Corps Surface-to-Air-Missile (Corps SAM) or the

Medium Extended Air Defense System (MEADS) as named by the international partnership, will provide the strategic deployability, tactical mobility, and lethal surface-to-air missile fire-power necessary to respond to a contingency crisis. It will be able to defeat low radar cross-section (RCS) targets such as the cruise missile (CM), unmanned aerial vehicles (UAV), tactical air-to-surface-missiles (TASM), anti-radiation missiles (ARM), and short range tactical ballistic missiles (TBM). It will be also capable of defeating fixed and rotary wing aircraft. [Ref. 11:p.3-1] Designed with strategic deployability in mind, Corps SAM will adapt well to providing early-on, lower-tier enclave defense, with Theater High Altitude Area Defense (THAAD) providing the upper-tier.

[Ref. 11:p.2-10]

There is a current void in the U.S. Army ADA force structure due to the retirement on September 1, 1994 of the aging and obsolete HAWK missile system. The HAWK was becoming increasingly incapable of meeting operational requirements and defending against a diverse and proliferated threat. Corps SAM will fill the current void in providing adequate protection for maneuver forces as those forces seek to overwhelm the enemy and achieve land force dominance.

Sun Tzu, an ancient Chinese philosopher, stated over twenty-five hundred years ago:

If you know the enemy and know yourself, you need not

fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle. [Ref. 35:p. 18]

Our soldiers must know the potential threat capabilities and their own on the battlefield. In the Acquisition Corps we must also know the potential threats. The threats or risks are cost overruns, failure to meet schedule, and poor weapon system performance. We must know our capabilities. In order to combat these risks and not succumb to their potential advantage over us, we must evaluate trade-off strategies.

This thesis reviews the short history of the Corps SAM program, concentrating on the issue of whether to maintain competition or to "down select" to a single contractor. It examines down selection and whether the risks of cost overrun, failure to meet schedule, and poor weapon performance can be averted without the use of continuous competition.

B. OBJECTIVES OF RESEARCH

The objective of this study is to examine whether down selection to one contractor provides less benefit than competition throughout the Corps SAM acquisition process, based on the factors of cost, schedule, performance, and associated risks.

C. RESEARCH QUESTIONS

Primary Research Question: Does down selection to one contractor at the end of Project Definition-Validation phase provide less benefit than maintaining competition throughout the acquisition process for the Corps SAM program?

Subsidiary Research Questions:

1. What were the factors against which the down selection decision was made?
2. What types of risks are associated with the down selection to one contractor in the Corps SAM program?
3. What is the actual impact of down selection on the program from an economic standpoint?

D. METHODOLOGY

This study begins with an overview of the Corps SAM program: the mission, background, evolution, and the Quadrilateral International Agreement that have maintained the viability of this program.

This is followed by an overview of the nature of competition, the history of competition in DOD, the types of competition, potential benefits of using competition early in the program, and the factors affecting the use of competition.

The focus then shifts to analyzing the program risk in terms of potential cost overruns, schedule delays and poor

performance. The researcher looks specifically at the factors involved in down selection. These factors are analyzed in terms of advantages and disadvantages. Then after analyzing the factors, the use of down selection is examined by reframing how down selection is normally viewed and how it is viewed from an economic standpoint.

This methodology for research focuses on information obtained from (1) current procurement literature obtained from the Naval Postgraduate School, (2) documentation obtained from the Corps SAM Program Office in Huntsville, AL, and (3) the Concept and Studies Division, United States Army Air Defense Artillery School at Fort Bliss, TX. Methodology also includes a search of Corps SAM and acquisition related references from (4) the Defense Technical Information Center (DTIC), and (5) the Defense Logistics Studies Information Exchange (DLSIE). Further research information was obtained from telephonic and personal interviews with the Corps SAM Deputy Program Manager and the Corps SAM Chief of Program & Acquisition Management at Huntsville, AL.

E. SCOPE OF STUDY

This study only addresses down selection and no other acquisition streamlining methods associated with the Corps SAM acquisition plan. This paper does not include system characteristics, capabilities, or discussions classified in

nature.

F. ASSUMPTIONS

It is assumed that readers of this study have an understanding of the basic concepts and regulations applicable to systems acquisition, and an understanding of economics.

G. BENEFITS OF THIS STUDY

By examining the Corps SAM program, this thesis serves as a basis for future research and discussion of down selection as a streamlining and tailoring method for a given major weapon system. A second objective is to consolidate references of various reports, documents, articles, and various program perspectives into a single source reference for Corps SAM.

II. CORPS SAM SYSTEM

A. INTRODUCTION

This chapter covers the background of the Corps SAM program from its early inception in 1987, to its cancellation and its rebirth, to another cancellation and rebirth, and several near cancellations, to where it is today. The Corps SAM Program has not had a solid institutional foundation since its beginnings, and not until recently has it achieved a firm base of Congressional support. Its history is full of cancellations, potential cancellations, funding cutbacks, and deferments. Though its road has not been a straight one, it now looks like the Corps SAM Program is here to stay as an international effort. [Ref. 29]

B. MISSION OF CORPS SAM

Corps SAM will fill the current void created by the retirement of the HAWK missile system in providing protection to the U.S. Army corps's critical assets and maneuver forces from air and missile attack. Corps SAM will counter, defeat, and destroy TBMs, CMs, UAVs, TASMs, ARMs, as well as rotary and fixed wing aircraft targeted against U.S. Army corps assets and maneuver units. It will operate in synergy with Forward Area Air Defense (FAAD), theater ADA assets such as

Patriot and THAAD, as well as joint and combined air defense systems. [Ref 10:p. 3-1] Then Major General John H. Little, Commandant, United States Army Air Defense Artillery School, stated the Corps SAM mission in 1993:

We need Corps SAM to protect Corps forces from short-range ballistic missiles, cruise missiles, UAVs, RPVs and low observable platforms. Corps SAM will deny preferred attack options to the enemy, reduce the threat of mass casualties in the maneuver area, incorporate a high degree of mobility to support the type of rapid Corps movements seen in Desert Storm and augment the Patriot and THAAD combination. [Ref. 24:p. 9]

C. BACKGROUND OF CORPS SAM

The Corps SAM program was initiated in 1987 when it was initially identified as the Medium Surface-to-Air Missile (MSAM) project. A system need was determined from data generated during a study of threat deficiencies that existed in the HAWK low-to-medium air defense system. The Senate Appropriations Committee, however, deferred this program until 1990 because the HAWK Product Improvement Program (PIP) enhancements were just being deployed. [Ref. 2:p. 1-1]

The present Corps SAM program was initiated in 1990. The Army Battlefield Development Plan identified the need for a corps air defense capability because of the inherent limitations in the HAWK air defense system. An analysis of the mission area indicated that the corps air defense need could not be satisfied by a nonmaterial solution. In August 1990, the Corps Air Defense Capability Mission Need Statement (MNS)

was validated by the Joint Requirements Oversight Council (JROC) and the Defense Acquisition Board (DAB) Milestone (MS) 0 review approved the program to enter the Concept Exploration and Development (CED) phase [Ref. 14:p. 2] The Corps SAM program was assigned to Project Management Office (PMO) authority in September 1990. [Ref. 2:p. 1-1]

Several months later the Army's Corps SAM program was canceled because of Congressional action to consolidate a long list of Pentagon anti-tactical ballistic missile projects into one program managed by the Strategic Defense Initiative Organization (SDIO), now the Ballistic Missile Defense Organization (BMDO). [Ref 6:p. 30]

The Corps SAM program was revived again in Fiscal Year (FY) 92 as an international project under the sponsorship of BMDO's Tactical Missile Defense Initiative to which Congress gave approval. In early 1992, the Corps SAM weapon system emerged as a top U.S. Army research priority due to the use of Iraqi Scud missiles during the Persian Gulf War, and the CED phase was restarted. This resulted in the award of seven contracts to six contractors in July 1992. These contractors consisted of Hughes Missile Systems, Tucson, AZ; Lockheed Missiles and Space Co., Sunnyvale, CA; Loral Vought Systems Corporation, Dallas, TX; Martin Marietta Electronics and Missiles, Orlando, FL; Raytheon Co., Lexington, MA; and British Aerospace, London. [Ref. 3:p. 11] [Ref. 9:p. 37] [Ref. 14:p. 2] During the CED studies, six contractors analyzed the

cost, schedule, and performance of modified existing systems, new surface-to-air missile systems, hypervelocity guns, and directed energy weapons.

Because of these studies, it was decided that a new surface-to-air missile system was the only viable solution to satisfy the Corps SAM concept requirements. Analysis of these studies also concluded that there was significant similarity in the technical solutions proposed, and therefore there were not significant differences in the risks associated with these solutions. [Ref. 12:p. C-10]

The Missile Command's (MICOM) Research, Development, and Engineering Center (RDEC) also conducted extensive studies and analyses that further defined feasible and cost effective system concepts, consistent with the emerging Corps SAM requirements and threat definition. These analyses, along with the results of the CED studies, were used to balance the requirements contained in the Operational Requirements Document (ORD). [Ref. 14:p. 2] During this phase, the Corps SAM ORD was jointly developed and approved by the U.S. Army and the U.S. Marine Corps.

In 1993, the Corps SAM program again faced scrutiny under the Pentagon Strategic Systems Committee's comprehensive review of BMDO's weapon programs. Budget constraints and competition from existing but less capable theater missile systems had the potential to cancel the Corps SAM program. [Ref. 23:p. 4]

Then in May 1993, then Under Secretary of Defense for Acquisition and Technology (USD(A&T)), John Deutch, expressed his support for the Corps SAM program to then Secretary of Defense (SECDEF) Les Aspin, then Chairman of the Joint Chiefs of Staff, General Colin Powell, and the military Service chiefs. This support by the USD(A&T) was instrumental, politically, in the survival of the Corps SAM program. Lieutenant General Donald Leonetti, then Commander, U.S. Army Space and Strategic Defense Command, also supported the Corps SAM program, stating that it was needed to counter low-flying missiles and aircraft. [Ref. 25:p. 8]

In September 1993, the JROC designated the U.S. Army as the final approval authority for the Corps SAM ORD. The ORD was approved by the Army Deputy Chief of Staff for Operations and Plans (DCSOPS) in October 1993. During FY94 the Corps SAM program office activities focused primarily on the development and release of the draft RFP for Concept Development phase, continued exploration of international cooperation opportunities, initiation of the Deputy Secretary of Defense's (DEPSECDEF) decision to pursue a trilateral international program, and revision of the acquisition strategy to include the trilateral cooperation. [Ref. 14:p. 2-3]

In February 1994 a joint memorandum for the USD(A&T) was signed by both the Vice Chief of Staff, Army and the Assistant Commandant of the Marine Corps stating that the requirements contained in the ORD satisfy the mission need for a joint Army

Corps SAM and Marine Corps MSAM system. This memorandum highlighted the compelling joint Corps SAM requirement that without it, the Army and Marine Corps maneuver forces would be placed at risk with no defense against short range ballistic missiles and only extremely limited capability against cruise missile attacks. [Ref. 14:p. 4]

Also in September 1993, the results of the SECDEF's Bottom-Up Review (BUR) delayed major development efforts on Corps SAM until FY98. The program was then restructured to conduct a Concept Development phase (FY95-97) in the interim.

The acquisition strategy was restructured to accommodate the results of the SECDEF's BUR, and the draft RFP for Concept Development was released on a limited basis to Loral-Vought, Lockheed, Martin Marietta, Raytheon, and Hughes Aircraft in April 1994. During the maturation of the Concept Development draft RFP, the Program Manager emphasized the need for a quality draft RFP so that comments from other agencies and especially industry could be incorporated into the final RFP. [Ref. 13:p. 7] Following the results of industry review of the draft, the RFP was updated and revised to incorporate the contractor's comments and recommendations. In addition, the PMO conducted several meetings with industry representatives to inform them of the program status.

The latest threat to the program occurred in July 1995, when the Senate Armed Services and Appropriations Committees deleted the entire 1996 Corps SAM funding request of \$30.4

million. The House committees also cut the funding request by \$20.4 million. These committees felt that the Army should look at existing technologies to develop one system that could provide seamless coverage against incoming missiles. (As mentioned earlier in this chapter, it had been previously determined that a nonmaterial solution would not satisfy the mission need.) The program was then provided with \$35 million in funding by a motion proposed by Senator Sam Nunn (D-GA), that reversed the committees' rulings.

[Ref. 21:p. 11] [Ref. 26:p. 32-33]

The program has survived to fulfill the user's stated mission need. Today the Corps SAM weapon system is envisioned to be the center of the U.S. Army's Corps Area Air Defense. The Corps SAM weapon system is planned to be fielded in the 3rd Quarter, 2005 time-frame. [Ref. 2:p. 1-1]

D. QUADRILATERAL INTERNATIONAL AGREEMENT

In addition to approving entry into the CED phase, Corps SAM's MS 0 Acquisition Decision Memorandum (ADM) required the Corps SAM program office to explore cooperative opportunities with allied countries. In August 1990, then USD(A&T) John Betti wanted to use Corps SAM as a first step to get other NATO nations and Japan involved in the International Defense Cooperation Strategy and sent a letter on 18 September 1990 to Germany urging involvement. The U.S. Army stated that other

nations were invited as well. [Ref 5:p. 10] In May 1991, the U.S. and Germany began a three-year study aimed at developing a long range air defense system. [Ref. 7:p. 29] The German Government was invited again in February 1994 by the USD(A&T) to participate in the Corps SAM program. Former USD(A&T) John Deutch stated to Germany and France, that without them, the U.S. could not make Corps SAM a reality. [Ref. 29] In June 1994, the German Government responded, expressing their desire to make the program a U.S. and European cooperative program by expanding the effort to France. In August 1994, the discussions between the DEPSECDEF and his counterparts from Germany and France resulted in a decision to pursue a trilateral cooperative program for development of Corps SAM. [Ref. 14:p. 3] Each of the Governments and their respective defense firms expressed interest in Corps SAM as a meaningful development program for the 1990s. [Ref. 8:p. 33]

Then in February 1995, the Italians expressed their desire to become part of the international agreement. The Corps SAM program was officially recognized as a Quadrilateral International program between the United States, Germany, France, and Italy on 20 February 1995. [Ref. 9:p. 37] Under this arrangement, costs and work will be shared 50 percent by the United States, 20 percent each by Germany and France, and 10 percent by Italy. [Ref. 34]

The Governments find this program to be mutually beneficial in terms of meeting military readiness and being

able to fulfill a need with their ever-dwindling defense budgets. The defense industries find this type of program appealing because it expands their international customer base. It is a win-win situation on a global scale during a time of shrinking defense budgets.

E. ACQUISITION STREAMLINING

Since the program's rebirth in August 1990, the Corps SAM Program Manager has been focused on acquisition streamlining. Acquisition streamlining is "any effort that results in more efficient and effective use of resources to develop or produce quality systems." [Ref. 37:p. 15-2] Early in the program, streamlining was focused on two primary principles: (1) avoidance of premature specification of the technical solution, and (2) obtaining industry input into the acquisition process. [Ref. 1] [Ref. 13:p. 1] These principles were factored into the Milestone (MS) I preparation and acquisition planning. Before issuance of the Corps SAM CED studies Request for Proposal (RFP) in February 1992, a Request for Information (RFI) was sent out to industry to provide the Government with a variety of technical information on components, subsystems, and systems that would be beneficial in providing a Corps SAM solution. This information was used to enhance independent Government studies and to ensure that the language in the CED studies was not too restrictive.

In addition, an industry briefing was conducted in which

industry questions were answered. This process helped contractors in understanding the Government's intent. During the source selection process, clear source selection criteria were used in which the technical concept was weighted the highest. [Ref. 13:p.1] This enabled resources to be focused in the areas that were most important.

Several methods of streamlining that are planned to be used in this procurement include concurrent engineering, combined Design and Development phase (provides seamless transition from Demonstration and Validation (DEM/VAL) phase to Engineering and Manufacturing Development (EMD) phase with no program breaks in design, fabrication, and test), system simulations, partnering, and down selection. This is also called total development. [Ref. 13:p. 1-8]

1. The 1995 Program Schedule

A revised, updated, and more streamlined Concept Development RFP was released on 1 March 1995, and proposals were received back in the Corps SAM program office on 2 June 1995. From the original six U.S. contractors who participated in the CED studies, down selection to two U.S. contractors occurred on 12 October 1995. Lockheed Martin and the H&R Company (the joint venture of Hughes Aircraft Company and Raytheon Company) were selected as the winners of the competition. The two U.S. contractors will team with the

International Contracting Teams made up of contractors from Germany, France, and Italy for about four months, updating their Project Definition-Validation (PD-V) Proposal. (The PD-V phase is adopted from the NATO Acquisition process. See Figures 1 and 2.) Contract awards are projected to occur in January 1996, following the signing of the Corps SAM Memorandum of Understanding between the U.S., Germany, France, and Italy. These two Contractor Teams will be required to conduct simulations, analyses, and trade-off studies to better define the system and to draft the system specification for development. Down selection to one International Team will occur when a proposal is chosen and a letter contract is signed to start work at MS I in the Design and Development phase. The only loser in this down selection will be one of the U.S. contractors. Once the Corps SAM office has leveraged the benefit of competing weapons designs from several contractors, the Corps SAM Program Manager (PM) will be able to make an informed choice as to the best design and down select to that one contractor. Down selection, in this Corps SAM acquisition process, is a means of managing risk control by trading-off the risk of a cost overrun for affordability.

[Ref. 34]

The development effort will also loosely reflect the NATO Acquisition Process and will be divided into two Project Definition-Validation (PD-V) contracts, followed by the Design and Development contract. The NATO PD-V phase is synonymous

Acquisition Process

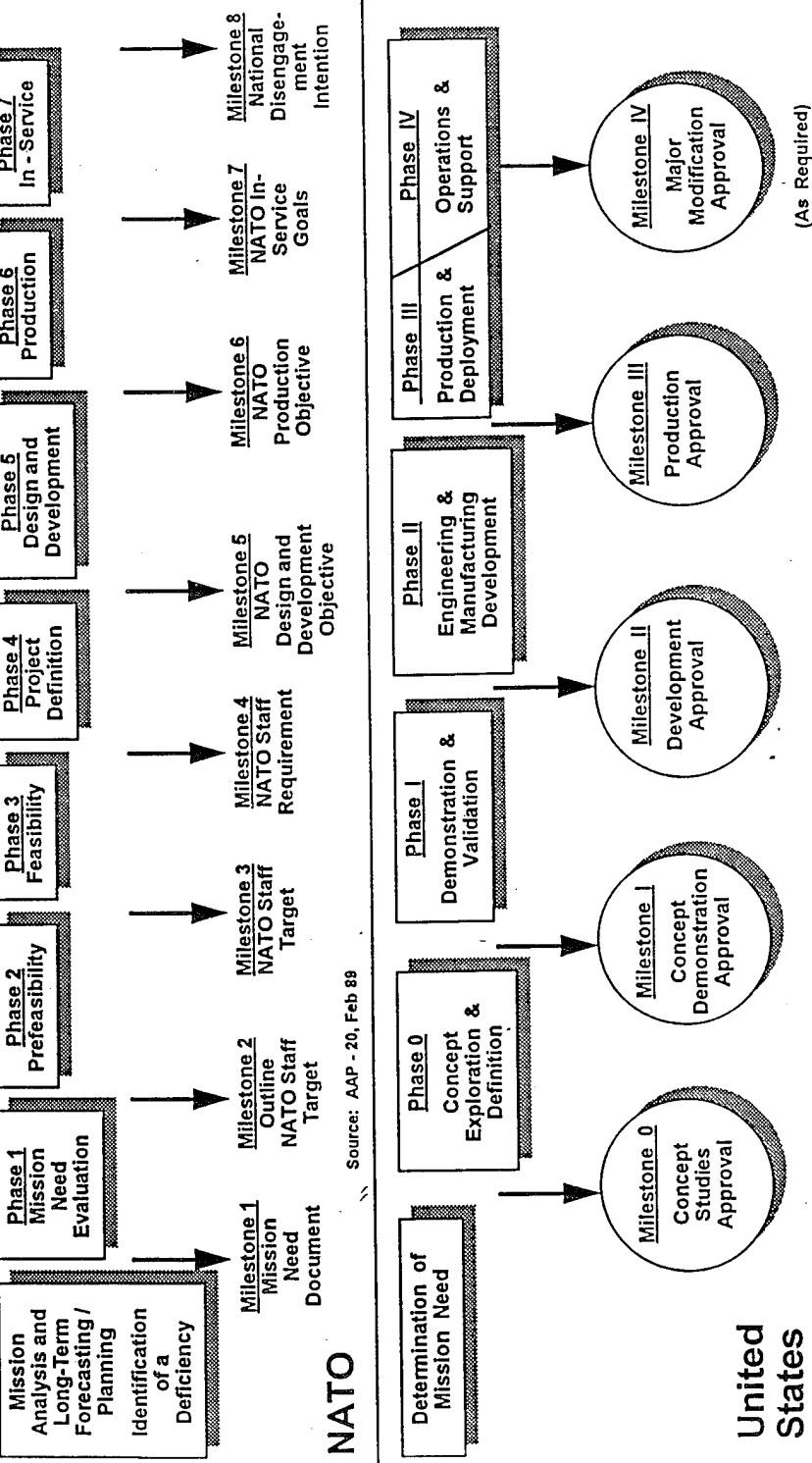
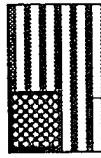
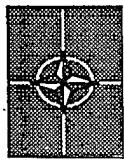


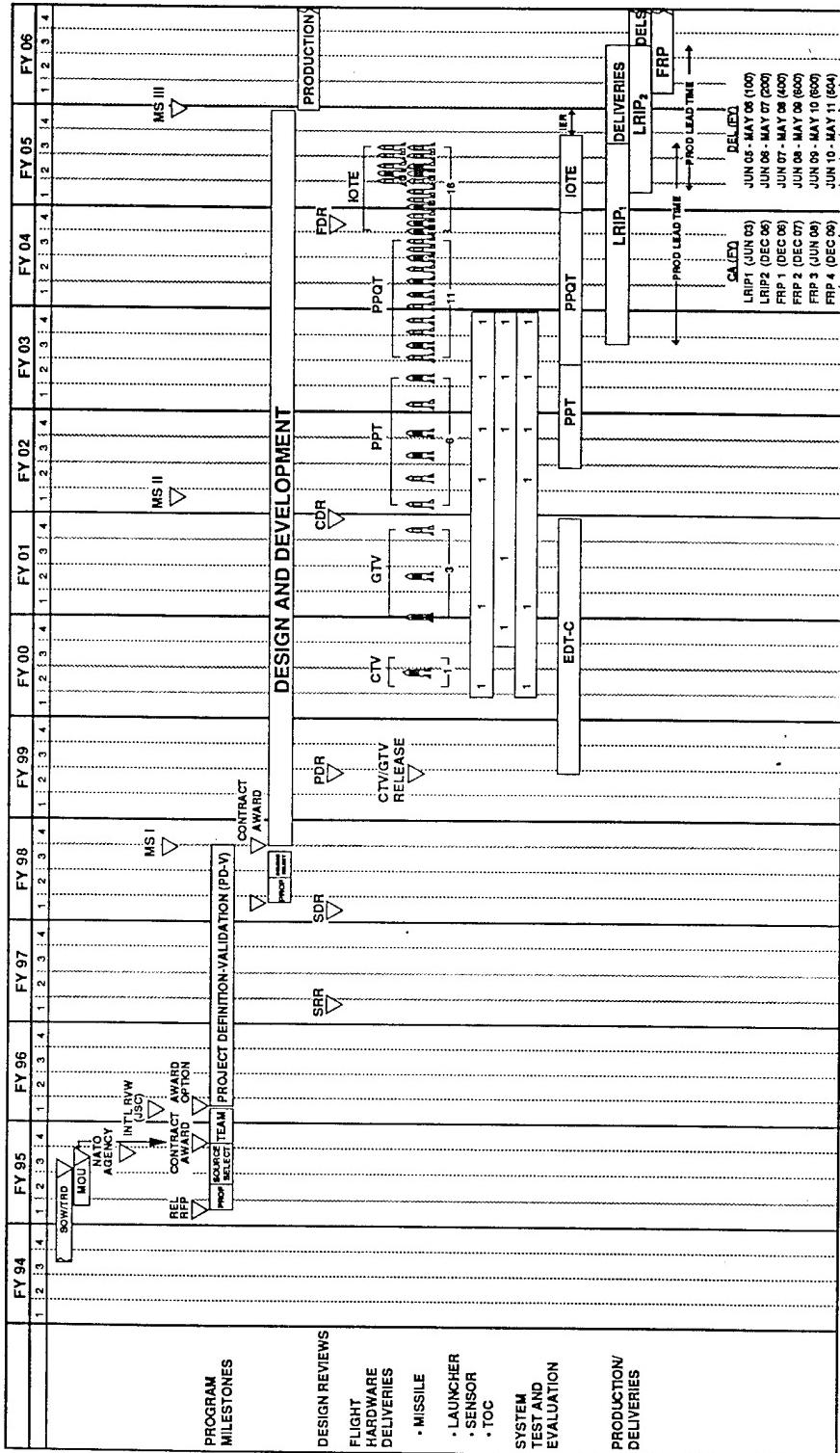
FIGURE 1

SOURCE: Corps SAM Program Office



UNCLASSIFIED

PROGRAM SCHEDULE (PD-V)

AS OF 21 NOV 94
USCIRF PRO STRAT

UNCLASSIFIED

FIGURE 2

SOURCE: Corps SAM Program Office

with the CED phase, and the NATO Design and Development phase is the combining of DEM/VAL and EMD phases. This combining will provide continuity in the development process that will include all efforts required to accomplish the objectives of both the DEM/VAL and EMD phases of development. Two U.S. prime contractors with their International Contractor Team counterparts will be awarded PD-V contracts. Based on work conducted during PD-V following receipt of the Design and Development proposals, the U.S. Government will down select to one contractor (See Figure 3).

Upon a successful MS I decision review, the selected contractor will execute the Design and Development effort. [Ref. 13:p. 4] This Design and Development contract will support system development from MS I to MS III, called the Design and Development phase, providing a "seamless" contract (ie., continuous development) during the MS II transition. At MS IV the decision will be made start the Production phase.

2. Strategy

The Corps SAM acquisition strategy is to procure the system development of the Corps SAM weapon system in a single competitively awarded cost-plus-incentive-fee/award-fee (CPIF/CPAF) contract. [Ref. 12:p. C-6] The Low Rate Initial Production (LRIP) contract will be a sole source CPIF contract because of its combining with the Design and Development



UNCLASSIFIED

MEADS PROGRAM SCHEDULE



PROJECT DEFINITION-VALIDATION (PD-V)

- 2 International Teams/Contracts
- International Statement Of Work/Technical Requirements Document
- System Requirements Review
- System Performance Spec
- Prime Item Performance Spec
- International Program Management Plan
- End To End System Simulation
- Validation Of Critical Functions/Technical Issues
- System Design Review

FIGURE 3

SOURCE: Corps SAM Program Office

contract. Subsequent full rate production contracts are expected to be sole source firm fixed-price contracts, and the duration of full production is estimated to be about 48 months. [Ref. 11:p. C-10]

III. AN OVERVIEW OF COMPETITION

A. INTRODUCTION

This chapter examines the background of competition in Government policy, the types of competition used in the acquisition process, and the advantages and disadvantages associated with the use of competition. The chapter then examines how competition and down selection has been used in the Corps SAM program. At the end of this chapter, an overview of risk management is introduced.

Increased competition in the acquisition of major weapon systems has been considered by both Government and industry as one possible solution to the many and well-publicized problems surrounding Government procurement. Besides the well-founded belief that competition will result in lower prices, other benefits include improved quality and reliability, technical innovation in addressing new requirements, the expansion of our industrial base, and the appearance of safeguarding the public trust in the awarding of contracts and the commitment of public funds. [Ref. 31:p. 10-12]

B. LAWS AND REGULATIONS

Preferences for competitive procurement methods have been clearly expressed in both Public Law and in Executive Branch policies. For example:

1. Office of Management and Budget Circular A-109, dated 5 April 1976, states in its general policy: [Ref. 27:p. 3]

- Express needs and program objectives in mission terms and not equipment terms to encourage innovation and competition in creating, exploring and developing alternative system design concepts.
- Place emphasis on the initial activities of the system acquisition process to allow competitive exploration of alternative system design concepts in response to mission needs.

2. Defense Appropriations Act of 1984 (Public Law 98-212) clearly requires that production competition analysis be conducted on all major weapon system acquisitions. The person responsible for ensuring that production competition analysis is conducted is the Program Manager. [Ref. 16:p. 1-4]

3. The Competition in Contracting Act (CICA) (Public Law 98-369), which became effective in April 1985, strongly affirms that "full and open competition" is the standard acquisition method and that sole source procurement is the exception. Full and open competition may be waived, however,

for several reasons including national emergency, national security, and terms of an agreement between the U.S. and a Foreign Government that has the effect of requiring the use of noncompetitive procedures. [Ref. 4:p. 2-17-2-18]

4. The DOD Directive 5000.1 states: [Ref.36:p. 1-6]

- Defense systems, subsystems, equipment, supplies and services shall be acquired on a competitive basis to the maximum extent practicable as a means of achieving cost, schedule, and performance benefits.
- The feasibility, cost, and benefits of competition in each phase of a program's implementation shall be explicitly addressed at each milestone, beginning with the new start milestone decision point. This includes competition for ideas and technologies in the early phases, and the use of competitive procedures that provide the greatest benefit to the Government.

5. The DOD Directive 5000.2 reflects legal requirements for competition at the prime and subcontractor level that must be considered during each acquisition phase and that Acquisition Category I (ACAT I) programs must have: [Ref. 37:p. 3-9, 3-12, 3-15]

- Competitive Prototyping. Acquisition strategies must include provisions for competitive prototyping unless the milestone decision authority determines that competitive prototyping is not practicable and such rationale is included in the Acquisition Strategy Report. (10 U.S.C. 2438)
- Competitive Alternative Development and

Production. Acquisition strategies must be prepared by the Secretary of Defense (as delegated) and must allow the option for competitive alternative sources for the system and each major subsystem under the program throughout the period from the beginning of full scale (engineering and manufacturing) development through the end of procurement. (10 U.S.C. 2439)

In short, a Program Manager is required by law and policy to pursue and seek out competition to the greatest extent possible during all phases of the acquisition process. There are, however, waivers to the competition requirement and competitive prototyping as mentioned earlier in this chapter.

C. DESIGN VS. PRODUCTION COMPETITION

In the decision-making scheme of awarding a contract to a potential contractor, the Program Manager is concerned with two forms of competition in the acquisition process: design or technical competition and production or price competition.

1. Design or Technical Competition

Design competition is:

- Competition during a program's validation or early design phase, where two or more companies develop conceptual or design approaches to satisfy a mission need, one or more of which will be used for the production contract. The competition can be extended through the DEM/VAL phase and into EMD phase to obtain prototype performance verification and to provide a natural competition for the production contract.

Typically, in large programs design competition ceases at EMD. The purpose of design competition is to select the best technical approach within affordable costs, thus providing a realistic cost. [Ref. 15:p. 5-1] [Ref. 16:p. 1-8]

The purpose of design competition is to identify and develop a variety of technical approaches that meet or exceed the mission need within the constraints of affordability. This competition primarily occurs during the preliminary phases of the acquisition process. The process for this competition is generally observed with the award of multiple contracts during the CED phase, followed by down selection to generally two or more contracts in DEM/VAL phase. This follows with the award of a contract to one or two contractors, who enter into EMD with a single design deemed to provide the best value to the Government. [Ref.16:p. 1-8-1-9]

2. Production Competition

Production competition is:

- Competition where two or more companies bid to secure all or part of a production contract. Thus there may be a winner-take-all competition or the production may be split between two contractors. The competitors may have participated in the program before the first production contract, or one or more may have been brought in through a second sourcing strategy. This competition occurs during EMD and/or Production phases. [Ref. 15:p. 5-1]
[Ref. 16:p. 1-12-1-15]

The goals of production competition are to procure the

system at a fair and reasonable price to both the Government and the contractors, to continue to encourage quality and technical improvements, and to expand the industrial base for use in case of full mobilization or surge requirements.

In contrast to design competition, which is concerned with projecting a realistic price, production competition is concerned with ensuring a fair and reasonable price. During production, however, the contractor's primary concern is with the profit earned from making the weapon system. It is during production in the sole source environment that the Government may see the cost of a system rising and find that it has little or no leverage to inhibit cost escalation. Production competition has been the most effective method the Government has used for ensuring that the price paid for the system is fair and reasonable. [Ref. 16: 1-8-1-14]

After working under the umbrella of CICA for 10 years, many observers are concerned that the strong preference for competition may be resulting, in certain cases, in improper cost, schedule, and performance trade-offs for added competitive awards. [Ref. 32:p. 121]

The Program Manager must think as an investor in competition. What is the Government's Return On Investment (ROI)? How much will it cost the Government to get a fair and reasonable price? If competition is chosen over down selection, the initial costs of competition can exceed any cost advantage realized later in the acquisition process when

managing a weapons program that is highly technical and complex. [Ref. 15:p. 5-3] The up-front investment is most apparent in production competition in soliciting a second source from the solicitation itself, the costs associated with the second source selection and qualification, technology transfer and possible proprietary data, procurement of special and general tooling and test equipment, and qualification testing. These are all nonrecurring costs invested by the Government in the program. There are also administrative costs associated with recurring solicitations and contract award, and the management of two contractors. The management of competition during the Production phase is especially complex, requiring significant management oversight to secure the benefits of competition. [Ref. 16:p. 1-17-1-19]

D. ADVANTAGES AND DISADVANTAGES OF COMPETITION

There are positive and negative aspects of competition in controlling program risk in terms of cost, schedule, and performance. Advantages include: [Ref. 15:p. 5-2-5-3]

- Obtaining a lower price for a product
- Obtaining a higher quality product
- Expanding the industrial base
- Enhancing surge capability in an emergency
- Providing more than one source for product innovation

- Facilitating the achievement of socioeconomic goals
- Meeting delivery schedule requirements
- Encouraging contractors to be more receptive to the concerns of the Government and to address criticisms

Disadvantages include:

- Increased initial cost due to duplication of work to administer contracts, prepare to produce a product, or accomplish a specific task
- More complex and costly support of duplicate products in the field
- Variations in quality between competitive products
- Weakening of any working relationship that exists between a specific contractor and the program office
- Increase in schedule length due to increased program complexity
- Increased difficulty in managing the program
- No guarantee that funding will be maintained
- Increased cost and schedule risk due to contractor learning curve retardation

E. COMPETITION IN THE CORPS SAM PROGRAM

In the Corps SAM acquisition strategy for accelerated procurement, design competition occurred with the awarding of seven contracts during CED and will continue through PD-V with two contracts. Production competition will not be used as

down selection to one contractor will occur at MS I, the beginning of the Design and Development phase. During the CED studies, there were significant similarities in the technical solutions among the contractor's proposals. The PM believes that there is little need for comparison among the technologies between the contractors and thus no need to carry both through Design and Development phase. It is at this point that the Program Manager feels that the competitive designs will be somewhat stable, and the trade-off between affordability and the risk of a cost overrun can be made.

[Ref. 28]

The Corps SAM Program Manager felt that competition after MS I would neither streamline the process nor reduce cost, schedule, and performance risk in the Design and Development or Production phases. [Ref. 28]

During the conduct of the Concept Definitions studies, as mentioned in the introduction, streamlining for the Corps SAM program became an increasingly important initiative of the Army leadership. The Army Acquisition Executive (AAE) issued a memorandum to the PEO, Missile Defense, which directed development of an innovative approach to the acquisition of Corps SAM. [Ref. 13:p. 1] Down selection to one contractor is one aspect of the Corps SAM program's innovative streamlining strategy. The researcher's primary purpose of thesis is to evaluate the Program Manager's decision to down select at MS I.

F. PROGRAM RISK IN TERMS OF COST, SCHEDULE, AND PERFORMANCE

In the development and production of new major weapon systems, the potential risk of cost overruns, schedule overruns, and poor performance is a very real threat to the program and a challenge to control. The PM of a program is tasked to manage and control risk. Program decisions concerning risk are normally concentrated on cost and schedule. The increasing user demand for weapon's performance opens the field to another area of risk, that of technical complexity of new weapon systems. This area must also be assessed by the PM, who must look at how the impact of cost and schedule decisions relate to technical performance. [Ref. 17:p. 2-2-2-4]

In weapon programs there are a variety of factors that must be analyzed before assuming a level of risk that is considered controllable. The presence or absence of program factors may induce or reduce a risky situation. The factors may denote sources of potential jeopardy in a program. The situation where the program could be jeopardized can be controlled by knowing these factors and taking action to overcome them. The PM must be aware of potential cost and schedule problems and their affect on potential technical risks. It is critical for the PM to make a risk assessment in analyzing these factors when deciding whether to choose

competition or down selection and if the risk is acceptable based on the assessment. [Ref. 17:p. 3-6-3-7] The risk factors in the Corps SAM program are discussed in the next chapter.

G. SUMMARY

This chapter presented Government policy that clearly expressed the Program Manager's responsibility to pursue competition. If in the best interests of the Government, waivers to competition may be attained. This chapter then discussed design and production competition and the associated benefits and concerns in using them. The plan for competition in the Corps SAM program was addressed, as well as the concerns of the costs associated with competition. Lastly, this chapter introduced an overview of risk management. The Corps SAM program after MS I will result in down selection if the PM will be granted waivers to competition and competitive prototyping.

IV. FACTORS AFFECTING COMPETITION VS. DOWN SELECTION

A. INTRODUCTION

In the context of down selection, there are factors that will persuade and convince the PM to choose down selection as an option in reducing risk in terms of cost, schedule, and performance in the acquisition process. This chapter focuses on the background of these factors, followed by how they relate to the Corps SAM program, and then present the advantages and disadvantages in terms of risk. At the end of this chapter, the factors will be presented in a summary table showing the decision on whether or not to down select.

B. ANALYSIS OF FACTORS AFFECTING THE DOWN SELECTION DECISION

The choice between the down selection to one contractor and competition is a complex management decision. Factors that influence the decision of whether to down select or compete a procurement after PD-V phase (MS I) can be broken down into three categories: cost, schedule, and performance. [Ref. 16] [Ref.31] In applying the factors that are tailored to the Corps SAM program for the down selection decision, the researcher found:

1. Cost Factors

a. Quantity to be Procured

Conceptually, the greater the quantity procured, the greater the potential for competition. There needs to be a sufficient quantity to be procured so that a contractor's capacity is used to the greatest extent. The contractor is naturally looking to achieve the greatest profit for their time invested. This decision is used primarily when the sum of the total recurring cost savings is less than the sum of the nonrecurring costs needed to establish two sources. [Ref. 16:p. 3-3]

Down selection to one contractor is inevitable in the procurement of Corps SAM and would occur at some point in the acquisition process due to the economies of scale associated with the low number of systems anticipated to be procured. According to Mr. Chester Domaracki, Deputy PM Corps SAM, the required number of systems to be procured is simply not enough work for two defense contractors to be carried into production of the Corps SAM system. The low quantity to be procured lends itself to down selection.

A disadvantage to down selection as it pertains to quantity is an increased risk by not maintaining the industrial base and by not providing a second contractor for surge capacity.

An advantage to having down selection as it pertains

to quantity is a reduced risk in the cost effectiveness in terms of the Government paying for excess capacity by one or both contractors.

b. Defense Budget and Down-sizing of the Industrial Base

The shrinking defense budget is inherent in all the following factors but today more than ever, the budget is a key factor. Potential contractors fully understand that the "chicken who laid the golden eggs" is long gone and that there is a trend for future declines in defense appropriations by Congress. This acknowledgment of future trends is obvious through the recent mergers of defense contractors like Martin Marietta and Lockheed, Raytheon and E-Systems, and Northrop and Grumman. They are preparing to survive these lean times by combining their expertise and diversifying. There is also a problem with the limited number of subcontractors available, mentioned later in this chapter. This problem also extends to prime contractors and has occurred in the Corps SAM program. At the beginning of this program there were originally six contractors used for CED. Since these contracts were initiated, Martin Marietta and Lockheed, both separate contractors competing for the Corps SAM program, merged.

Competition throughout the acquisition process may simply become totally unaffordable for the development of

new major weapon systems. The Government and industry are already feeling the "do more with less" trend. There is also no guarantee that the funding will be maintained as described in the background of the Corps SAM program. If this trend continues, down selection will be the only way to gain a contractor's interest in investing the company's time and effort. If down-sizing also continues in the Government, the ability to provide quality oversight management will be less effective with competition.

A disadvantage of down selection is an increased risk in reduction of the industrial base.

An advantage of down selection is decreased risk in cost due to running out of funding early on in the program.

c. Contract Type

The type of contract used, if designed carefully, can probably provide the same benefits as mentioned in Chapter III. A cost-plus-award-fee (CPAF) contract, used in the Design and Development phase, contains an award fee pool of money established by the Government to reward the contractor for meeting or exceeding a specific effort in meeting the Government's needs. The key element of this type of contract is the flexibility that it provides. The Government can change the area where it wants the contractor to be incentivized. The Government can provide advance guidance for

any performance period influencing the contractor's efforts in areas of cost, schedule, and performance to ensure that the Government's needs are met.

The Corps SAM contract will be a very complex cost type contract, consisting of a cost-plus-incentive-fee and CPAF. This contract type can be structured to gain the same benefits of competition according to the Deputy PM for Corps SAM. [Ref. 33] There is also a potential problem in using competition in a joint venture situation where the joint venture begins to act as a single entity exercising monopoly power. If the Government doesn't have the contracts or management oversight set up to control this, the benefits of competition will be lost.

A disadvantage of down selection is the increased cost risk involved when the Government is dealing with only one contractor who may not be able to perform the contract.

An advantage of down selection is the reduced cost risk when the Government is providing management oversight to only one contractor who can be incentivized to be successful.

d. Special Tooling, Test Equipment and Facilities

If costs of special tooling, test equipment and facilities are high, the number of potential competitive contractors will decrease, and the likelihood of cost effective competition will decrease, providing the down

selection to one contractor as the only alternative.

[Ref. 31:p. 17]

New technology implies that there will be special tooling, test equipment and facilities and that their costs will be high. With the low quantity to be procured, it may not be advantageous for contractors to compete, especially if start up costs are significant. Down selecting to one contractor saves dual costs to the Government.

A disadvantage of down selection is the increased cost risk of not having an additional source for tooling.

An advantage of down selection is the reduced cost risk of not having dual costs for tooling.

e. *Contractor Capacity*

Adequate capacity is necessary for down selection to one contractor. If the sole contractor doesn't have the capacity to produce the required quantity according to the delivery schedule, development of an additional source could be made mandatory to produce the difference. If the contractor has excess capacity, a reduction in the production quantity awarded may significantly increase the costs of production through increased overhead per unit. [Ref. 16:p. 3-3]

Contractor capacity is assumed to be adequate for the effort required. Since no production facility is currently

manufacturing the Corps SAM system, it should be possible to minimize the risk associated with not having the capacity or excess capacity, since there is a fixed number of systems to be produced. In the downsizing environment that we are in today, contractor capacity should not be a problem.

A disadvantage of down selection is the increased cost and schedule risk of having to create an additional source late in the production schedule, due to the original contractor not being able to produce the needed quantities or meet the delivery schedule.

An advantage of down selection is the reduced cost risk in maintaining two sources for production.

2. Schedule Factors

a. User Need Time Frame

This factor is critical when dealing with a fixed budget and time frame. If two contractors were to be used, given a fixed amount of money each year, it would take longer to produce the weapon system.

The Corps SAM program is working with a fixed budget each year, and the user needs the system as soon as possible. To field the Corps SAM weapon system as rapidly as possible, down selection is the better alternative to avoid increased program schedule length.

A disadvantage of down selection is the increased

schedule risk if the single contractor incurs technical problems delaying the development of the weapon system.

An advantage of down selection is the reduced schedule and cost risk where the Government has a fixed yearly budget in managing a single contractor.

b. Production Duration

Conceptually, the shorter the duration of the projected production, the better choice down selection to one contractor becomes. Competition will result in increased up-front costs for the Government as compared to down selection, and both the Government and contractors may fail to gain the benefits of competition, especially if the two contractors are interested in a long production run. [Ref. 31:p. 16] A short duration also may not provide sufficient time to offset the cost in developing and qualifying both contractors.

The duration of the production phase is estimated to be four to five years and is considered extremely short compared to, for example, the 13 years of production experienced by the Patriot system. This factor definitely provides no incentive for competition, when a sole source will only be in production for such a short time.

A disadvantage of down selection is increased cost and schedule risk due to the lack of competition, especially if a surge need is developed.

An advantage of down selection is the reduced cost risk of establishing and maintaining two production facilities.

c. Learning Curve

Conceptually, the flatter the learning curve, the greater the potential for competition. With a steeper learning curve there is a greater potential for two contractors in a joint venture to become unbalanced in technical capability and they may not be able to effectively compete, due to the potential unbalanced technical capabilities, where the more learned producer can decrease unit costs rapidly as cumulative quantity of the product increases. In this situation, the Government has weak leverage to maintain teaming in technology transfer. [Ref. 16:p. 2-19] [Ref. 31:p. 17]

Due to the seamless transition providing continuity with the Design and Development phase, the Corps SAM program will gain the benefits of the learning curve. This program structure allows for continuity in design, hardware build, and testing throughout the program. This allows mitigation of the risks associated with the gaps in these activities normally associated with the classical two-step development process. It significantly reduces the likelihood of losing experienced personnel and vendors during

these gaps. The Corps SAM concept will use new technology to fulfill the requirements. New technology implies the probability of a steep learning curve. The less capable competitor may not be able to effectively compete with the more capable producer. If able to compete, the other contractor may not be able to "catch up" if the more capable producer can decrease unit costs rapidly as cumulative quantity of the product increases. Competition can dilute the benefits of the learning curve as compared to a down selection situation. Leveraging the advantages of the learning curve in the down selection to one contractor is a strong point for choosing down selection.

A disadvantage of down selection is the increased cost and schedule risk involved in not leveraging the use of two contractors to reduce costs and provide two production facilities.

An advantage of down selection is the reduced cost risk of leveraging the single contractor's learning curve.

d. Degree of Subcontracting

If a majority of the system is subcontracted, down selection to one contractor would be the preferred method over production competition for two reasons. First, if the specific subcontractors needed are limited, the prime contractors will compete for the same subcontractors, which

could result in higher prices. Second, with most of the system being subcontracted out, competition between primes would be futile since they only control a small part of the production costs. [Ref. 16:p. 3-5]

For the Corps SAM system, the number of subcontractors available is limited, and competition by two primes would result in use both primes using the same subcontractors. This would definitely result in higher prices for subsystems, given fixed total quantities. [Ref. 33]

A disadvantage of down selection is the increased cost and schedule risk of maintaining the industrial base of subcontractors.

An advantage of down selection is the reduced cost and schedule risk involved in a limited number of subcontractors. The single prime contractor can promote competition among subcontractors where two prime contractors could not.

3. Performance Factors

a. Technical Complexity

In general, the more complex the system is in terms of external and internal interfaces, as well as software dependency, the more appealing competition appears. When high levels of technology are used, the Government can leverage the expertise of both contractors. If the Government uses only

one contractor, it may take longer to solve the technical problem or it may be unsolvable without additional outside expertise. If production competition is desired, direct contractor-to-contractor exchange is required in Technical Data Package (TDP) transfers. [Ref. 16:p. 3-4]

Two contractors will be carried through the PD-V phase and might have been used through Design and Development phase; however, during the CED studies there were significant similarities in the technical solutions proposed. These significant similarities may constitute a waiver for Competitive System Protoyping. Since there is little need for comparison among technologies between the contractors, there is no need to carry both through Design and Development. The Deputy PM for Corps SAM stated that this will save them hundreds of millions of dollars in their program. [Ref. 33] The purpose of the two contractors going through PD-V is to determine and select the contractor who provides the "best value" in terms of system concept and program.

The Corps SAM system will be highly software dependent and will be the most complex, technologically advanced weapon system in the U.S. Army's Air Defense Artillery. Software in major weapon system development is well known for causing cost overruns, schedule overruns, and performance problems. There is a potential for major problems in only having one contractor.

A disadvantage to down selection is the increased

performance and cost risk involved in not leveraging the expertise of an additional contractor who may discover technological and innovative breakthroughs not realized by using only one contractor.

An advantage of the down selection in Corps SAM is that there are significant similarities in the technical solutions proposed and thus little need for comparison among technologies between the contractors.

b. Configuration Control and Maintenance Requirements

Competition may very well involve the fielding of two systems that perform identically, but do not use the same maintenance parts and procedures. This is not a problem in down selection to one contractor; however, it would be a reason to choose down selection over production competition.

[Ref. 16:p. 13-9]

The PM is confronted with configuration control and design responsibilities once the contractor team is split for competitive production. It isn't cost efficient to have two different contractors building two systems that perform identically, but use different maintenance parts and procedures. It also isn't cost efficient in terms of maintaining two complete sets of spares for two systems. The PM could establish a configuration control board to ensure strict configuration maintenance. This move to achieve

configuration control may also discourage innovative design changes that could reduce costs; both are reasons for conducting production competition. This should be a discriminator for choosing down selection.

A disadvantage to down selection is the increased performance and cost risk by not having two contractors that can provide spares.

An advantage of down selection is the reduced performance and cost risk by not having to maintain two complete sets of spares for two almost identical systems. Different spares may also have an impact on reliability and survivability among the same system.

4. The International Factor to be Considered

The desires of the Quadrilateral International partners are taken seriously by the U.S. Government, which wants this international program to be successful. This political interest has resulted in the international partners exerting a large influence on the acquisition process, namely the desire for down selection to one contractor and incorporation of the NATO Acquisition Process. The international partners have a vested interest in this program, because they have a mission need and a shrinking defense budget as well. They agree with the partnership approach and have been adamant about working with only one U.S. contractor. The international

associates believe building a partnership with a single contractor will be the most efficient means to control risk and affordability. Politically, down selection is the better choice.

C. SUMMARY

Thus we see that, on balance, the PM's choice to down select reduces risk. The PM has many factors to consider in managing and controlling risk. The presence or absence of such factors mentioned in this chapter denote sources of potential risk in a program. In this situation, the program can be jeopardized. If these factors are analyzed by the PM, an assessment can be made and action taken to overcome each factor's inherent risk that can cause the program to be over cost, behind schedule, or result in a weapon system that falls short of the user's requirements. Table 1 is presented on the following page that consolidates the factors discussed in this chapter.

COMPETITION VS. DOWN SELECTION DECISION MODEL IN THE CORPS SAM PROGRAM			
CHOOSE			
FACTORS TO BE CONSIDERED		DOWN SELECTION	COMPETITION
COST FACTORS			
QUANTITY TO BE PROCURED	HIGH		X
	LOW	X	
DEFENSE BUDGET AND THE INDUSTRIAL BASE	GROWING		X
	SHRINKING	X	
CONTRACT TYPE (DEVELOPMENTAL PHASE) (WITH PARTNERING)	FIXED TYPE		
	COST PLUS	X	X
SPECIAL TOOLING, TEST EQUIPMENT, & FACILITIES COSTS	LOW		X
	HIGH	X	
CONTRACTOR CAPACITY	LARGE		X
	SMALL	X	
SCHEDULE FACTORS			
USER NEED TIME FRAME IN RELATION TO BUDGET	LATER		X
	IMMEDIATE	X	
PRODUCTION DURATION	LONG		X
	SHORT	X	
LEARNING CURVE	FLAT		X
	STEEP	X	
DEGREE OF SUBCONTRACTING (NUMBER OF SUBKRS AVAILABLE)	LARGE		X
	SMALL	X	
PERFORMANCE FACTORS			
TECHNICAL COMPLEXITY (SIMILARITY AMONG DESIGNS)	LOW		
	HIGH	X	X
NEED FOR CONFIGURATION CONTROL AND LOW MAINTENANCE REQUIREMENTS	LOW		X
	HIGH	X	
OTHER FACTOR TO BE CONSIDERED			
FOREIGN GOVERNMENT AND INDUSTRY PARTICIPATION (POLITICAL INTEREST)	LOW		X
	HIGH	X	X

TABLE 1

SOURCE: Developed by Researcher

V. THE ECONOMIC VIEW OF COMPETITION

A. INTRODUCTION

In Defense procurement it is an implicit assumption that the competition created in the acquisition process is imperfect competition and that competition is good. At the other end of the spectrum it is also an implicit assumption that down selection creates a monopoly and that down selection is the less desirable alternative. The purpose of this chapter is to question these assumptions by examining the underlying economic aspects of different types of competition.

B. CLASSIFICATIONS OF COMPETITION

In economics, competition is classified in the marketplace into five principal categories: perfect competition; effective competition; imperfect competition, which consists of monopolistic, oligopolistic, and oligopsonistic competition; monopoly; and monopsony. The determining factors in each of these classifications are based on the number of buyers and sellers in the market:

[Ref. 18:p. 2-2-2-3]

- Perfect Competition exists when there are many sellers and buyers, the product is homogeneous and perfectly interchangeable, and the price is determined by supply and demand. The seller may decide to sell or refuse to sell at the existing

price; the seller does not control the price.

- Effective Competition is the same as perfect competition, except that the number of sellers is limited. There must however, be enough sellers so that no one seller dominates the market. All sellers are independent and active rivals, and new firms can enter the market easily.
- Monopolistic Competition is the same as perfect competition, except that there is product differentiation; that is, the sellers are able to establish real or illusory differences among the products they offer for sale. The seller is able to control price to some degree if buyers can be convinced that the seller's product is different from those of other sellers. Much retail trade falls into this category.
- Oligopolistic Competition exists when there are few sellers and many buyers of products that have degrees of difference. The seller, through advertising and quality differentiation, is able to control price to some extent. Products such as cars, major appliances, and steel are included in this category.
- Oligopsonistic Competition is like oligopolistic competition, except that there are many sellers and only a few buyers. Sellers of raw materials such as tobacco growers are in this category.
- Monopoly exists when there is one seller and one or more buyers of a product that has no close substitutes. The seller has considerable control over price, so much that the prices of some sellers, like utilities, are regulated. Monopoly also exists when, as with sole-source military items, there is one seller and one buyer. The seller's control over price varies according to circumstances that determine bargaining strength.
- Monopsony exists when there are one or more sellers and one buyer of interchangeable products. The sellers tend to have little effective control over price.

In summary, under perfect and effective competition the seller has no control over price. The seller has more control

over price if the seller is closer to being the only one offering the specific product, as long as there are many buyers.

It is inherent in competition that both seller and buyer will try to take advantage of the situation, according to their own advantage. The seller will offer a price that will satisfy its goals and the buyer will pay a price no higher than necessary to get the product that will satisfy its objective. The one that will prevail depends on the relative bargaining strengths of each, the number of buyers and sellers of the product, the costs, the amount of profit, the intensity of demand, and the alternatives available to both buyers and sellers. The Government as the buyer must agree on a price that is fair and reasonable; that is, the Government accepts the agreement based on best value and the seller accepts the agreement based on full costs plus a reasonable profit.

[Ref. 18:p. 2-5]

The Corps SAM Program Manager is operating as a monopsonist (the sole buyer). This situation is one of monopsony, lending itself to competitive negotiations. Though there is a Quadrilateral International partnership involved, members are essentially a joint entity wanting to purchase the same product. There is no competition among these buyers (monopsonists) to vie for the sellers' product and each partner's desire is the goal of all the buyers. This partnership is a synergistic relationship such that all the

partners will be able to buy the Corps SAM weapon system, which individually they could not afford.

C. MONOPSONY

So, why does the Government use competition? The answer is monopsonistic leverage. The individual price the monopsonist (one buyer) pays to each oligopolists (a few sellers) is likely to be lower than the Government would pay to a monopolist (one seller) in a bilateral monopoly. Although the monopsonist has an advantage over the oligopolistic contractors, the Government is not likely to use its advantage to the fullest extent. Too low a price would drive the contractors out of business or cause collusion among the contractors. The Government will therefore pay enough to keep the contractors in business, probably at a relatively low rate of profit. In both monopsony and bilateral monopoly, at the end of negotiations, the result that both the Government and contractor want is a mutually satisfying agreement.

Initially, once a nonmaterial solution is no longer an option, competition is critical for the Government to discover what is the latest technology available, by using design competition. As in the Corps SAM program, the similarity in technical approaches of the contractors negated the need for competitive prototyping and for competition beyond the PD-V phase. Competition is one method or the preferred method for

controlling risk, gaining reduced cost, better quality and reliability, technical innovation, expansion of the industrial base, and the appearance of safeguarding the public trust in using the public's funds. Competition is the only option to control risk at the beginning of the acquisition process, however, it is not the only option after PD-V phase. It is important to understand that competition provides the appearance of safeguarding the public's funds. The Government could also obtain the benefits of competition by using a bilateral monopoly where the contractor would feel that it and the Government would be on a more level playing field. The Government would show a sincere level of trust that isn't found in monopsony where the Government appears to be achieving a cheaper price for a quality product. The bilateral monopoly lends itself to a more level playing field and a more trusting relationship between the Government and the contractor--more so than a monopsonistic situation.

D. BILATERAL MONOPOLY

Once the Corps SAM Program Manager down selects to one contractor, there is no longer a monopsony. It is a bilateral monopoly, not a monopoly. What happens when a monopolist (the contractor-seller) negotiates with a monopsonist (the Government-buyer)? When there are only one seller and one

buyer, this market is called a bilateral monopoly. Both the buyer and seller are in a bargaining situation. There is no rule that will determine if this will be a win-win, win-lose, or lose-lose situation. One party might have more time and patience, or might be able to convince the other party that it will walk away if the price is too low or too high.

This bilateral monopoly is rare, but there is a rough principle that applies: Monopsony power and monopoly power will counteract each other. This means that the monopsony power of buyers will reduce the effective monopoly power of sellers, and vice versa. This doesn't mean that the market will end up looking perfectly competitive. For example, the monopoly power may be large and monopsony power small, so that the residual monopoly power would still be significant. A characteristic of a bilateral monopoly that places the two parties on a level playing field, equalizing the monopoly and monopsony power, is if the parties cannot easily enter into the other's niche. The Government cannot easily build the Corps SAM system itself and the contractor cannot create a market to sell to. If each party cannot enter the other's field, both are likely to be reasonable in negotiating a contract price.

A bilateral monopsony could look perfectly competitive. Conceptually, monopsony power of the buyer will push the price closer to marginal cost, and monopoly power will push price closer to marginal benefit. In other words, at the margin, the

buyer and seller will have to negotiate a contract that is mutually satisfying. [Ref. 30:p. 357-362] The bilateral monopoly between the Government and the down selected contractor has the similar effect of a market that would be perfectly competitive. Just like perfect competition where there are many buyers and many sellers, a bilateral monopoly between the Government and the contractor creates a situation where both have roughly equal power.

In perfect competition, there are many buyers and many sellers so that each buyer or seller has a negligible influence on price in the market. In a bilateral monopoly, the Government has created the market: a one buyer, one seller market. There is a negligible influence on price in this market. The Government wants a quality product at a fair and reasonable price and the contractor wants to provide a quality product for a fair and reasonable profit. In perfect competition, the product is homogeneous so that the product is identical to every other product such that buyers and sellers are indifferent, given the price, about whom they buy from or sell to. In a bilateral monopoly, the Government is buying a product that doesn't currently exist. The weapon system is homogeneous unto itself and thus, in a sense it is a one of a kind product. Thus, like perfect competition, in the bilateral monopoly the bottom line is the price, given that quality can be controlled. More so than a monopsonistic situation, the bilateral monopoly leads to a level playing

field and a more trusting relationship through partnering between the Government and the contractor.

E. PARTNERING

In a bilateral monopoly, the contractor can prove to be an invaluable resource to the Government by making direct contributions to the program's success. A sound relationship between the Government and the contractor can facilitate: the buyer's efforts to gain cooperation on cost reduction programs; willingness to provide innovations in processes, procedures and technological advancements; superior weapon performance; and quality service. Such relationships are a major divergence from the more traditional adversarial relationships between the Government and the contractor. Trust must be developed in a long-term relationship where the Government shares its true needs with the contractor, and the contractor provides a weapon system that fulfills the needs of the user. Partnering can also provide a level of oversight by the Government that is not adversarial and that will enhance the acquisition process in terms of cost, schedule, and performance. [Ref. 19:p. 179-181]

The lack of competition after MS I will be supplanted by the Corps SAM management process based on the concept of partnering. This relationship is based on the understanding that the Government and the contractor both want

to reach the same goals. The Government wants the contractors to earn a fair and reasonable profit, and the contractor wants the Government to receive a weapon system that performs according to the requirements. Following award of the Design and Development contract to the contractor whose proposal offers the "best value" to the Government, the Government and contractor partnership will enter a partner building phase to build a foundation for a successful program execution. Program requirements, detailed plans, streamlining efforts, program management control points and plans to satisfy exit criteria will be reviewed and refined during this period. The partnering approach will reduce program risk due to a mutual, early understanding of the program baseline and early consideration of all factors that relate to successful execution of the program requirements. This will then enhance program stability and affordability, since there will be less chance of change, redesign, redirection, or conflicting perspectives as the program is executed. [Ref. 12:p. C-7]

This approach makes sense since Corps SAM manpower and management oversight is limited, and the quality of that oversight would be degraded if it had to be spread over two contractors. The schedule duration could also be increased due to the increased program complexity of trying to manage a competitive program after MS I.

F. SUMMARY

This chapter introduced the classifications of competition from an economic standpoint and explained that once the Corps SAM PM down selects to one contractor, there will be a bilateral monopoly. This situation provides a level playing field, allowing the Government and contractor to trust each other. This professional, trusting relationship is further reinforced through partnering, creating a win-win situation that is mutually satisfying.

VI. SUMMARY AND AREAS FOR FURTHER RESEARCH

A. SUMMARY

Down selection to one contractor will provide more benefit than competition to the Corps SAM program. Down selection will provide the Government with a bilateral monopoly that places both the buyer and seller in a bargaining position, where no one party has the "upper hand." The Government and the contractor will negotiate a CPAF/CPIF contract that is mutually satisfying and reasonable for the Design and Development phase. The low quantity to be procured and the short duration of production will preclude awarding of development and production contracts to two contractors, due to economies of scale. The similarity in technical approaches of the contractors also negates the need for competitive prototyping to occur. By working with one contractor early on, partnering will be well-established in order to control risk and affordability. There should be less redesign, changes to hardware and software, and redirection of effort, because "everyone is on the same sheet of music." This will result in a much more efficient and effective development process, when coupled with the flexibility of a CPAF contract. The down selection allows for continuity of design, hardware build, and testing throughout the program. With this seamless transition between DEM/VAL and EMD (both of these phases make

up the Design and Development phase), the likelihood of losing experienced personnel and subcontractors is significantly reduced, while leveraging the learning curve by having the same contractor throughout the whole process. The special tooling, test equipment and facilities costs will be reduced significantly by not having two contractors.

Down selection is the better alternative because with the declining defense budget, we are also experiencing a declining Government manpower and defense industry base. This means that contractors will be forced to be more competitive early on to survive the trend today and of the future--that of the shrinking defense budget. This will mean early "best and final offers" and force the contractors to control costs once CPAF contracts are awarded. The bottom line is that both the Government and industry will have to "do more with less."

The final reason for down selection is politically driven. The Quadrilateral International partners want down selection as they feel it is the best way to control costs and risks.

On May 18, 1995 an Acquisition Reform Bill was introduced in the House as part of the Federal Acquisition Reform Act (FARA) that states that competitions would be held to the "maximum extent practical." This would relax the current preference for full and open competition. Congress may be recognizing that competition with new Government weapons programs may not be the better means of providing the benefits

of quality and best value after all. [Ref. 20:p.4]

In conclusion, down selection to one contractor appears to provide more benefit and lowered risk than competition to the Corps SAM program. Sun Tzu might have stated that in choosing this alternative that the Corps SAM Program Office "need not fear the result of a hundred battles" [Ref. 35:p. 18]-- they know their capabilities and those of the "enemy."

B. AREAS FOR FURTHER RESEARCH

There are several areas within the Corps SAM program that are candidates for further research. These potential topics are listed below.

What has been and is the role of politics involved in the shaping of the Corps SAM program? How has politics affected the acquisition process in terms of controlling cost, schedule, and performance? Politics has kept this program alive, but how has politics influenced the PM in the execution of the program?

How has the Quadrilateral International partnership affected the Corps SAM acquisition process? How has it supported or hindered the risk of this program in terms of controlling cost, schedule, and performance? How has the NATO acquisition process affected the program?

How has down selection to one contractor affected the success of the Corps SAM program? Was down selection actually

more beneficial than competition in terms of controlling cost, schedule, and performance? Did the early planning pay off?

LIST OF REFERENCES

1. "Acquisition Streamlining," Corps SAM Project Office Briefing, 1992.
2. AEPCO, Inc., Corps Surface-to-Air Missile (SAM) System Manpower, Personnel and Training Analysis (MANPRINT), March 19, 1993.
3. "Army Awards Corps SAM Contracts," Air Defense Artillery, November - December 1992.
4. Arnavas, Donald P., Government Contract Guidebook, Federal Publications Inc., Washington D.C., 1987.
5. Baker, Caleb, "Betti Urges Foreign Participation in CORPS SAM Project," Defense News, October 8, 1990.
6. Baker, Caleb, Army's Corpsam Project is Canceled, but Legacy Lives On, Defense News, February 11, 1991.
7. Baker, Caleb, "U. S., Germany to Pursue New Air Defense Weapon," Defense News, May 27, 1991.
8. Baker, Caleb, "Firms Prepare for Corpsam Work Despite Concern Over Budget Cuts," Defense News, January 27, 1992.
9. Briganti, Giovanni, "Skimpy Details Fail to Slow MEADS," Defense News, February 27-March 5, 1995.
10. COLSA Corporation, Corps Surface to Air Missile System Training Impact Analysis (Corps SAM TIA), October 5, 1992.
11. Commandant, United States Army Air Defense Artillery School, Corps SAM Operational Concept, CORP SAM Concepts and Studies Division, Ft. Bliss, Texas, May 26, 1994.
12. Corps SAM Project Office, Acquisition Strategy Report for Corps SAM, Integrated Program Summary Annex C, July 27, 1993.
13. Corps SAM Project Office, "Corps SAM Acquisition Streamlining," Historical Report, 1992 and 1993.
14. Corps SAM Project Office, "Corps SAM Acquisition Streamlining," Historical Report, 1994.

15. Defense Systems Management College, Fort Belvoir, Virginia, Acquisition Strategy Guide, July 1984.
16. Defense Systems Management College, Fort Belvior, Virginia, Establishing Competitive Production Sources, August 1984.
17. Defense Systems Management College, Fort Belvior, Virginia, Risk Management: Concepts and Guidance, March 1989.
18. Department of Defense, Armed Services Pricing Manual, Vol 2., 1986.
19. Dobler, D.W., D.N. Burt, and L. Lee, Purchasing and Materials Management, McGraw-Hill, Inc., 1990.
20. Erlich, Jeff, "Acquisition Plan Would Ease Rules On Competition," Defense News, May 22-28, 1995.
21. Glashow, Jason, "Restored U.S. MEADS Funding May Save 4-Nation Deal," Defense News, August 7-13, 1995.
22. Joint Chiefs of Staff, National Military Strategy of the United States, Washington D.C., 1992.
23. Leopold, George, "Budget, Options May Halt Corpsam," Defense News, May 3-9, 1993.
24. Little, Major General John H., "State of ADA," Air Defense Artillery, January - February 1993.
25. Muradian, Vago, "Corpsam Wins Key Ally in Deutch," Defense News, June 7-13, 1993.
26. Naylor, Sean D., "Congress grants MEADS a Reprieve," Army Times, August 21, 1995.
27. Office of Management and Budget (OMB) Circular No. A-109, Major System Acquisition, 5 April 1976.
28. Personal Interview with Mr. Chester Domaracki, Deputy PM Corps SAM, Huntsville, Alabama, and the researcher, 13-16 December 1994.
29. Personal Interview with Mr. Byron Lawing, Chief Program & Acquisition Management Corps SAM, Huntsville, Alabama, and the researcher, 13-16 December 1994.

30. Pindyck, Robert S. and Rubenfeld, Daniel L., Microeconomics, Macmillan Publishing Co., New York, New York, 1992.
31. Sellers, Benjamin R., Commander, "Second Sourcing: A Way to Enhance Production Competition," Program Manager, May-June 1983.
32. Sherman, Stanley N., Government Procurement Management, Wordcrafters Publications, Germantown, Maryland, 1991.
33. Telephone Interview with Mr. Chester Domaracki, Deputy PM Corps SAM, Huntsville, Alabama, and the researcher, 28 November 1994.
34. Telephone Interview with Mr. Chester Domaracki, Deputy PM Corps SAM, Huntsville, Alabama, and the researcher, 21 March, 16 October 1995.
35. Tzu, Sun, The Art of War, Dell Publishing, New York, New York, 1983.
36. Under Secretary of Defense (Acquisition), Department of Defense Directive Number 5000.1, Department of Defense, February 23, 1991.
37. Under Secretary of Defense (Acquisition), Department of Defense Instruction Number 5000.2, Department of Defense, February 23, 1991.

INITIAL DISTRIBUTION LIST

	No. Copies
1. Defense Technical Information Center 8725 John J. Kingman Rd. STE 0944 Ft. Belvoir, Virginia 22060-6218	2
2. Library, Code 13 Naval Postgraduate School Monterey, California 93943-5101	2
3. Defense Logistics Studies Information Exchange U.S. Army Logistics Management Center Fort Lee, Virginia 23801-6043	1
4. Acquisition Library Department of Systems Management Naval Postgraduate School Monterey, California 93943-5103	1
5. OASA (RDA) ATTN: SARD-ZAC 103 Army Pentagon Washington, D.C. 20310-0103	1
6. SFAE-MD-SM-P PEO Missile Defense P.O. Box 1500 Huntsville, Alabama 35807-3801	1
7. Prof. David V. Lamm (Code SM/Lt) Naval Postgraduate School Monterey, California 93943-5100	5
8. LTC Keith Snider (Code SM/Sk) Naval Postgraduate School Monterey, California 93943-5100	3
9. Prof. Mark W. Stone (Code SM/St) Naval Postgraduate School Monterey, California 93943-5100	2

- | | |
|--|---|
| 10. LTC John T. Dillard (Code SM/Dj)
Naval Postgraduate School
Monterey, California 93943-5100 | 1 |
| 11. CPT Thomas R. Marino Jr.
12185 Manor Court
La Plata, Maryland 20646 | 2 |